The Dangers of Carbon Monoxide: Part 2

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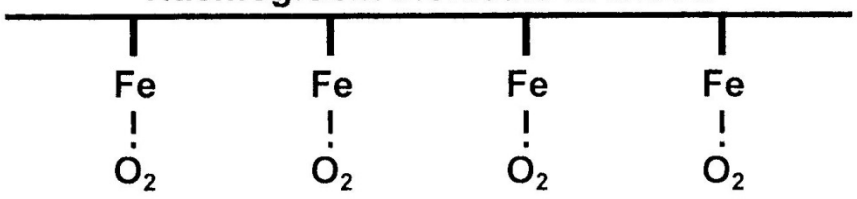
Previously, we showed how carbon monoxide can become dispersed through the air due to its neutral density. After looking at the normal respiration process, we'll see what happens when we inhale carbon monoxide.

Respiration is a basic process for life. We take air containing about 79% nitrogen and 20% oxygen into our lungs. In the lungs, the air comes into contact with our blood. Haemoglobin is a molecule in the blood which contains four iron atoms (Fe is the chemical symbol for iron that we will be using). Oxygen in the air is transported across a membrane in the lungs. One oxygen molecule, consisting of two oxygen atoms, attaches itself to each iron atom on the haemoglobin to oxygenate the blood (see Figure 1).

Figure 1: Oxygenated Blood Leaving Lungs:

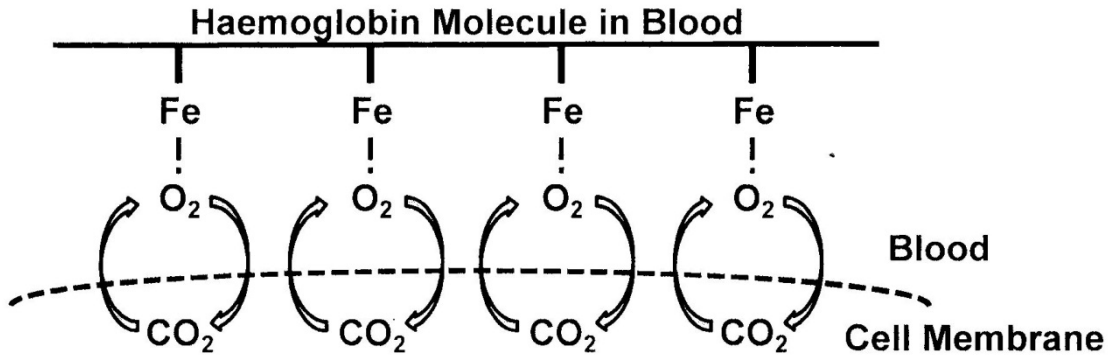


The heart then pumps the blood to all parts of the body to supply our cells with oxygen needed to carry out various cellular functions. As a product of the respiration process, carbon dioxide and water are formed within the cells.

In order for respiration to continue, the carbon dioxide must be removed. Oxygenated blood comes along to accomplish this task.

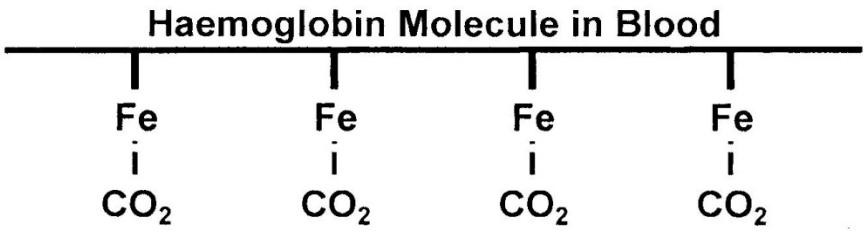
Oxygen is released from the iron atoms on the haemoglobin and diffuses through a membrane into the cell. At the same time, carbon dioxide diffuses in the other direction out of the cell and bonds to the iron atoms. (see Figure 2)

Figure 2: Oxygenated Blood at Cell Membrane:



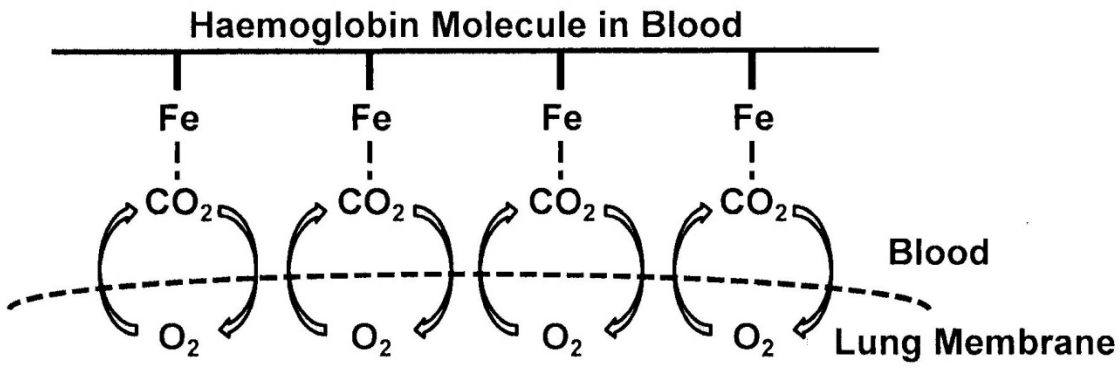
The blood is now depleted of its oxygen which has been replaced by carbon dioxide, as shown in Figure 3, and returns to the lungs.

Figure 3: De-oxygenated Blood Leaving Cell Membrane:



Back in the lungs, carbon dioxide is released from the iron atoms on the haemoglobin and is replaced by oxygen (see Figure 4). This cycle repeats itself over and over again on a continuous basis.

Figure 4: De-oxygenated Blood at Lung Membrane:



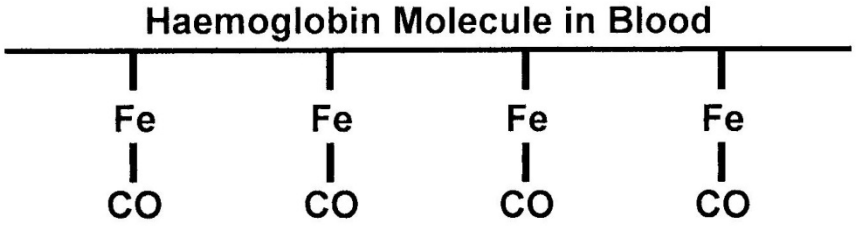
At this point, the haemoglobin in the blood will appear as it did in Figure 1.

If carbon monoxide happens to be in the air entering the lungs, it will preferentially attach itself to some of the iron atoms in the blood. This prevents the blood from becoming fully oxygenated. Due to its molecular structure, carbon monoxide bonds tenaciously to the iron atoms on the haemoglobin in the blood and refuses to let go.

The blood then travels on its path through the body and comes back to the lungs, still holding onto the carbon monoxide molecules. The few remaining iron atoms without carbon monoxide attached to them are able to remove only a slight amount of carbon dioxide from the cells in the body.

Back in the lungs, more carbon monoxide can be picked up while the CO that was there previously stays in place. Within a relatively short time, all the iron atom sites can become occupied with carbon monoxide bound to them, as we see in Figure 5.

Figure 5: Carbon Monoxide Bonded to Haemoglobin:



With no oxygen present in the blood, the body's cellular functions are severely disrupted in a potentially life-threatening situation. The attraction of carbon monoxide to the iron atoms on the blood's haemoglobin is so strong, that even the administration of pure oxygen by trained medical personnel may not be sufficient to displace it.

As you can see, carbon monoxide is not something to be taken lightly. Even if it was not a legal requirement, it still makes incredibly good sense to have a working carbon monoxide detector properly installed in your home. If you're a "belt and suspender" type person who wants to be even more cautious, why not place one on each level of your home to be on the safe side.

Just be sure that you conform to all regulations requiring at least one of them to be installed within a specified distance from sleeping areas. In this way, the alarm will wake you in case of danger during the night. Once again, for the actual regulations in Ontario, be sure to go the Ontario Association of Ontario Fire Chiefs' website at www.oafc.on.ca. It's important that you do so.